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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,833	06/23/2005	Hiroyuki Sato	10936-87	2138

24256 7590 01/29/2008

DINSMORE & SHOHL, LLP
1900 CHEMED CENTER
255 EAST FIFTH STREET
CINCINNATI, OH 45202

EXAMINER	
LOEWE, ROBERT S	

ART UNIT	PAPER NUMBER
1796	

MAIL DATE	DELIVERY MODE
01/29/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/540,833	SATO ET AL.	
	Examiner	Art Unit	
	Robert Loewe	1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 December 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *3-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/ are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETALIED ACTION

Applicant's arguments remarks, filed on 12/17/07, have been fully acknowledged.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 3-5, 7 and 10-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Sato et al. (JP-2000-191785). For convenience, the English translation, provided by Schreiber Translations, will be relied upon. All citations herein below refer to the English translation.

Claim 5: Sato et al. teaches a process for producing a poly(arylene sulfide) by polymerizing a sulfur source and a dihalo-aromatic compound in an organic amide solvent. Sato et al. first teaches a dehydration step whereby sodium sulfide and NMP are subjected to distillation, removing a part of the distillate containing water (paragraph 0057). While Sato et al. employs sodium sulfide pentahydrate as the starting material of application example 1, Sato et al. does teach that the sodium sulfide can be produced in situ by reaction of sodium hydrosulfide and sodium hydroxide (paragraph 0018). Sato et al. further teaches if this is the case, then the sodium hydrosulfide and sodium hydroxide are added in equimolar amounts (paragraph 0026). Sato et al. therefore effectively anticipates the process limitations corresponding to dehydration step (1) of instant claim 5.

Sato et al. further teaches a charging step of adding sodium hydroxide and water to the mixture remaining after the dehydration step such that the mole ratio of water to charged sulfur source is from 0.5 to 2.0 (paragraph 0026) and the total number of moles of NaOH to charged sulfur source is 1.083. Arrival at the value is shown below:

Application example of Sato et al.

Na_2S (22.54 mol) + H_2O → 2 NaOH (1.00 mol) + H_2S (0.50 mol)

Total available "S" is (22.54 mol - 0.50 mol) = 22.04 mol

Since Sato et al. teaches that Na_2S can be prepared in situ from sodium hydroxide and sodium hydrosulfide (paragraph 0018) in approximately equimolar amounts (paragraph 0026) Sato et al. teaches the following set of reactions when using an equimolar amount of NaOH and NaSH (the number of moles of each component is such that it equals the number of moles of Na_2S starting material used by Sato et al. in the application example):

(1) NaOH (22.54 mol) + NaSH (22.54 mol) → Na_2S (22.54 mol) + H_2O

(2) Na_2S (22.54) + H_2O → 2 NaOH (1.00 mol) + H_2S (0.50 mol)

Total available "S" is (22.43 mol - 0.31 mol) = 22.04 mol

Sato et al. further teaches that 13.3 g of NaOH (0.333 mol) is then added, providing for 22.873 mol of NaOH (22.04 + 0.333). Additionally there are 1.00 mol of NaOH generated by volatilization of H_2S, thus yielding a total of 23.873 mol of NaOH (22.873 + 1.00). The mol ratio of NaOH in the reactor/available S is thus (23.873/22.04) = 1.083, which falls in the claimed mole ratio of instant claim 5. Sato et al. therefore effectively anticipates the process limitations corresponding to charging step (2) of instant claim 5.

Sato et al. further teaches a first-stage polymerization step of adding a dihalo-aromatic compound to the mixture followed by polymerization at 170 °C to 270 °C to form a prepolymer at a conversion rate of 50-98 mol% (paragraph 0035 and application example 1). Sato et al. therefore effectively anticipates the process limitations corresponding to a first-stage polymerization step (3) of instant claim 5.

Sato et al. further teaches a second-stage polymerization step of controlling the amount of water such that there is from 2.0 up to 10 mol of water per mole of charged sulfur source with heating at 245 °C to 290 °C to continue polymerization (paragraph 0035 and application example 1). Sato et al. therefore effectively anticipates the process limitations corresponding to a second-stage polymerization step (4) of instant claim 1. In summary, Sato et al. anticipates all of the claimed process steps of instant claim 5.

Claim 7: Sato et al. further teaches during the dehydration step, that the reaction mixture is heated to a temperature of 100 to 250 °C (paragraph 0028).

Claim 10: Sato et al. does not explicitly teach that the prepolymer according to instant claim 5 has a melt viscosity during the first-stage polymerization step of 0.5 to 30 Pa·s. However, the poly(arylene sulfide) as taught by Sato et al. and Applicant's disclosure are both produced in the same manner, therefore any physical properties achieved by the compositions of Sato and the instant application would be inherently be the same. A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). See also *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "Where the claimed and prior art products are identical or

substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established." See MPEP 2112.01

Claim 11: Sato et al. further teaches after the second-stage polymerization step, (5) a separation step of separating the polymer from the reaction mixture containing the polymer, and (6) a washing step of washing the polymer thus separated with an organic solvent (paragraphs 0048 and 0058).

Claim 12: Sato et al. further teaches that the separation is achieved by sieving/filtering (paragraph 0058, washing with water and drying section).

Claim 13: Sato et al. further teaches that the organic solvent used in the washing step is acetone (paragraph 0048).

Claims 14-16: Sato et al. does not explicitly teach the claim limitations of instant claims 14-16. However, the poly(arylene sulfide) as taught by Sato et al. and Applicant's disclosure are both produced in the same manner, therefore any physical properties achieved by the compositions of Sato and the instant application would inherently be the same. A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). See also *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established." See MPEP 2112.01.

Claims 3 and 4: Sato et al. inherently teaches the same process for preparing a poly(arylene sulfide) as applied to claim 5 above. Sato et al. does not explicitly teach a poly(arylene sulfide) having a bis(4-chlorophenyl)sulfide content lower than 50 ppm as determined by a gas chromatographic analysis, and a ratio (MV2/MV1) of a melt viscosity value (MV2) of the poly(arylene sulfide) after a reaction with aminosilane to a melt viscosity value (MV1) before the reaction exceeding 2.0 as measured at a temperature of 310 °C and a shear rate of 1,216 sec^{-1}. Sato et al. also does not explicitly teach a poly(arylene sulfide) having a bis(4-chlorophenyl)sulfide content is at most 30 ppm, the ratio (MV2/MV1) is 2.1 to 3.0, and the yellow index is at most 7. However, the poly(arylene sulfide) as taught by Sato et al. and Applicant's disclosure are both produced in the same manner, therefore any physical properties achieved by the compositions of Sato and the instant application would inherently be the same. A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). See also *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established." See MPEP 2112.01.

Claims 3-5 and 7-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Miyahara et al. (US Pat. 5,840,830).

Claim 5: Miyahara et al. teaches a process for producing a poly(arylene sulfide) by polymerizing a sulfur source and a dihalo-aromatic compound in an organic amide solvent. Miyahara et al. first teaches a dehydration step whereby sodium sulfide and NMP are subjected to distillation, removing a part of the distillate containing water (10:55-67). While Miyahara et al. employs sodium sulfide pentahydrate as the starting material in the working examples, Miyahara et al. does teach that the sodium sulfide can be produced in situ by reaction of sodium hydrosulfide and sodium hydroxide (4:61-64) "in an almost equimolar amount" (6:49-53). Miyahara et al. therefore effectively anticipates the process limitations corresponding to dehydration step (1) of instant claim 5.

Miyahara et al. further teaches a charging step of adding sodium hydroxide and water to the mixture remaining after the dehydration step such that the mole ratio of water to charged sulfur source is from 0.3 to 5.0 (6:61-65) and the total number of moles of NaOH to charged sulfur source is 1.083. Arrival at the value is shown below:

Example of Miyahara et al. (12:34-51)

Na_2S (22.83 mol) + H_2O $\rightarrow$ 2 NaOH (0.88 mol) + H_2S (0.44 mol)

Total available "S" is (22.54 mol - 0.50 mol) = 22.39 mol

Since Miyahara et al. teaches that Na_2S can be prepared in situ from sodium hydroxide and sodium hydrosulfide (4:61-64) "in an almost equimolar amount" (6:49-53) Miyahara et al. teaches the following set of reactions when using an equimolar amount of NaOH and NaSH (the number of moles of each component is such that it equals the number of moles of Na_2S starting material used by Miyahara et al. in the application example):

(1) NaOH (22.83 mol) + NaSH (22.83 mol) → Na_2S (22.83 mol) + H_2O

(2) Na_2S (22.54) + H_2O → 2 NaOH (0.88 mol) + H_2S (0.44 mol)

Total available "S" is (22.83 mol - 0.44 mol) = 22.39 mol

Miyahara et al. further teaches that 7.9 g of NaOH (0.198 mol) is then added, providing for 22.57 mol of NaOH (22.39 + 0.198). Additionally there are 0.88 mol of NaOH generated by volatilization of H_2S, thus yielding a total of 23.45 mol of NaOH (22.57 + 0.88). The mol ratio of NaOH in the reactor/available S is thus (23.45/22.83) = 1.027, which falls in the claimed mole ratios of instant claims 5, 8 and 9. Miyahara et al. therefore effectively anticipates the process limitations corresponding to charging step (2) of instant claim 5.

Miyahara et al. further teaches a first-stage polymerization step of adding a dihalo-aromatic compound to the mixture followed by polymerization at 180 °C to 235 °C to form a prepolymer at a conversion rate of 50-98 mol% (9:23-34). Miyahara et al. therefore effectively anticipates the process limitations corresponding to a first-stage polymerization step (3) of instant claim 5.

Miyahara et al. further teaches a second-stage polymerization step of controlling the amount of water such that there is from 2.0 up to 10 mol of water per mole of charged sulfur source with heating at 245 °C to 290 °C to continue polymerization (9:23-34). Miyahara et al. therefore effectively anticipates the process limitations corresponding to a second-stage polymerization step (4) of instant claim 5. In summary, Sato et al. anticipates all of the claimed process steps of instant claim 5.

Claim 7: Miyahara et al. further teaches during the dehydration step, that the reaction mixture is heated to a temperature of 60 to 280 °C (7:11-24).

Claim 10: Miyahara et al. does not explicitly teach that the prepolymer according to instant claim 5 has a melt viscosity during the first-stage polymerization step of 0.5 to 30 Pa·s. However, the poly(arylene sulfide) as taught by Miyahara et al. and Applicant's disclosure are both produced in the same manner, therefore any physical properties achieved by the compositions of Miyahara and the instant application would be inherently be the same. A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). See also *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established." See MPEP 2112.01

Claim 11: Miyahara et al. further teaches after the second-stage polymerization step, (5) a separation step of separating the polymer from the reaction mixture containing the polymer, and (6) a washing step of washing the polymer thus separated with an organic solvent (9:49-64).

Claim 12: Miyahara et al. further teaches that the separation is achieved by sieving/filtering (9:49-64).

Claim 13: Miyahara et al. further teaches that the organic solvent used in the washing step is acetone (11:21-26).

Claims 14-16: Miyahara et al. does not explicitly teach the claim limitations of instant claims 14-16. However, the poly(arylene sulfide) as taught by Miyahara et al. and Applicant's disclosure are both produced in the same manner, therefore any physical properties achieved by

the compositions of Miyahara and the instant application would inherently be the same. A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). See also *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established." See MPEP 2112.01.

Claims 3 and 4: Miyahara et al. inherently teaches the same process for preparing a poly(arylene sulfide) as applied to claim 5 above. Miyahara et al. does not explicitly teach a poly(arylene sulfide) having a bis(4-chlorophenyl)sulfide content lower than 50 ppm as determined by a gas chromatographic analysis, and a ratio (MV2/MV1) of a melt viscosity value (MV2) of the poly(arylene sulfide) after a reaction with aminosilane to a melt viscosity value (MV1) before the reaction exceeding 2.0 as measured at a temperature of 310 °C and a shear rate of 1,216 sec^{-1}. Miyahara et al. also does not explicitly teach a poly(arylene sulfide) having a bis(4-chlorophenyl)sulfide content is at most 30 ppm, the ratio (MV2/MV1) is 2.1 to 3.0, and the yellow index is at most 7. However, the poly(arylene sulfide) as taught by Miyahara et al. and Applicant's disclosure are both produced in the same manner, therefore any physical properties achieved by the compositions of Miyahara and the instant application would inherently be the same. A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

See also *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established." See MPEP 2112.01.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 6 and 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. as applied to claim 5 above.

Sato et al. teaches the claimed process for preparing poly(arylene sulfides) of instant claim 5, as described above. Sato et al. does not explicitly teach that the alkali-metal hydroxides and alkali-metal hydrosulfides are supplied as respective aqueous mixtures. However, at the time of invention, a person having ordinary skill in the art would have found it obvious to employ these materials as aqueous mixtures and would have been motivated to do so since, for large-scale industrial reactions, it is often desirable to employ solutions of reactive solids, as opposed to handling the materials in solid form. For example sodium hydroxide, and sodium hydrosulfide are corrosive and reactive materials which are best handled in aqueous form to promote safer handling and simplicity of addition into reaction vessels.

Claims 8 and 9: Sato et al. inherently teaches by way of modification (such modification being the result of applying the teachings of paragraphs 0018 and 0026 of Sato et al.) of a working example (paragraph 0057) that the ratio of sodium hydroxide to available sulfur is 1.083

as described above. While 1.083 falls just outside the upper range limits of instant claims 8 and 9 (1.08 and 1.075, respectively), it does not represent the only possible value based on the teachings of Sato et al. Sato et al. teaches that the sodium sulfide can be prepared in situ by reaction of "about an equal mol" of NaSH and NaOH (paragraph 0026). The phrase "about an equal mol" does not limit the mole ratio to be 1.000. A person having ordinary skill in the art would recognize this to be the case and would not be restricted to one and only one mole ratio. It follows that slight adjustments in the mole ratio of NaOH to NaSH may be carried out, yielding a NaOH/available sulfur ratio of just above and below 1.083, which would then partially overlap with the claimed ratios of instant claims 8 and 9.

Further, a person having ordinary skill in the art would recognize that a NaOH/"S" ratio of 1.083 is very close to 1.08 and 1.075 and would expect that the resulting properties of the polymers to be substantially the same. "A prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected [the claimed product and a product disclosed in the prior art] to have the same properties." *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). In addition, the instant application does not see substantial differences in the final physical properties of the poly(arylene sulfides) until a NaOH/"S" ratio of 1.10 is employed.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyahara et al. as applied to claim 5 above.

Miyahara et al. teaches the claimed process for preparing poly(arylene sulfides) of instant claim 5, as described above. Miyahara et al. does not explicitly teach that the alkali-metal hydroxides and alkali-metal hydrosulfides are supplied as respective aqueous mixtures. However, at the time of invention, a person having ordinary skill in the art would have found it obvious to employ these materials as aqueous mixtures and would have been motivated to do so since, for large-scale industrial reactions, it is often desirable to employ solutions of reactive solids, as opposed to handling the materials in solid form. For example sodium hydroxide, and sodium hydrosulfide are corrosive and reactive materials which are best handled in aqueous form to promote safer handling and simplicity of addition into reaction vessels.

Response to Arguments

Applicant's arguments with respect to claims 3-16 have been considered but are moot in view of the new ground(s) of rejection.

Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert Loewe whose telephone number is (571) 270-3298. The examiner can normally be reached on Monday through Friday from 9:30 AM to 7:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Eashoo can be reached on (571) 272-1197. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RSL
23-Jan-08

RANDY GULAKOWSKI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700